

WHAT IS CLAIMED IS:

1. A diffraction laser encoder apparatus for positional and movement information measurement of a target having a diffraction grating made thereon, said apparatus comprising:

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a laser light source for generating a source beam;

a polarization beam splitter assembly comprising a polarization beam splitter for receiving said source beam for splitting a P-polarization component and an S-polarization component of said source beam into parallel and offset beams;

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a focusing lens assembly comprising a focusing lens for focusing said P-polarization component and said S-polarization component beams onto said target diffraction grating and returning diffracted P-polarization and diffracted S-polarization beams back into said polarization beam splitter for generating a detector beam coaxially containing said diffracted P-polarization and said diffracted S-polarization beams; and

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a detector assembly for receiving said detector beam for electrical processing and analysis for resolving into said positional and movement information.

2. The diffraction laser encoder apparatus of claim 1, wherein said polarization beam splitter assembly further comprises:

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a P-polarization reflector means, comprising a P-polarization quarter-wave plate and a planar reflector; said P-polarization component of said source beam leaving said polarization beam splitter, passing through said P-polarization quarter-wave plate, reflected by said planar reflector and passing through said P-polarization quarter-wave plate again and reentering said polarization beam splitter.

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3. The diffraction laser encoder apparatus of claim 1, wherein said polarization beam splitter assembly further comprises:

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an S-polarization reflector means, comprising an S-polarization quarter-wave plate and a corner cube reflector; said S-polarization component of said source beam leaving said polarization beam splitter, passing through said S-polarization quarter-wave plate, reflected and offset by said corner cube reflector and passing through said S-polarization quarter-wave plate again and reentering said polarization beam splitter.

4. The diffraction laser encoder apparatus of claim 1, wherein said focusing lens assembly further comprising a reflector mirror positioned at the back focal point of said focusing lens.